▪ Central Place Theory by Christaller

Central Place Theory (CPT) is an attempt to explain the spatial arrangement, size, and number of settlements. The theory was originally published in **1933** by a German geographer Walter Christaller who studied the settlement patterns of **Bavaria, southern Germany.** In the flat landscape of southern Germany Christaller noticed that towns of a certain size were roughly equidistant. By examining and defining the functions of the settlement structure and the size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes. This study included the analyzing the relationships between settlements of different sizes and related their economic activities (market) with the population.

Walter Christaller explained why the highest order settlement has very peculiar activities which can only be supported by them and the reason behind those activities taking place only in those particular highest order settlements. He also explained the nature of activities in different order of settlements. Central place theory is of great importance even after decades and forms the basis of various present-day theories used in urban planning.

Assumptions of Central Place Theory

Walter Christaller made **some assumptions** to make his theory easy to understand and form the basis for other theories. These assumptions were necessary and hold good to explain the structure of settlements. These also take into account the growth and development of towns, human behavior and fundamentals of economics.

Central place theory is based on the **following assumptions:**

1. **An even (flat) terrain** – A hilly and uneven terrain poses difficulty in development thus a flat area which promotes the growth of the town.
2. **Evenly distributed population** – residents are not concentrated at one particular place and no preference exists for a particular town.
3. **Evenly distributed resources** – no place has an advantage of resources, all placed will compete under perfect market conditions.
4. **Similar purchasing power** – along with the population and resources, wealth is also fairly distributed. Because of this people have similar purchasing power.
5. **Preference for the nearest market** – people will buy products from the nearest market and avoid the long commute. This keeps price constant as per other assumptions.
6. **Equal transportation cost** (proportional to distance) – the cost incurred in transporting of goods is equal for all and is proportional to the distance.
7. **Perfect competition** – price is decided on basis of demand and supply. People will buy at the lowest price which market has to offer, no seller has an advantage over another seller.

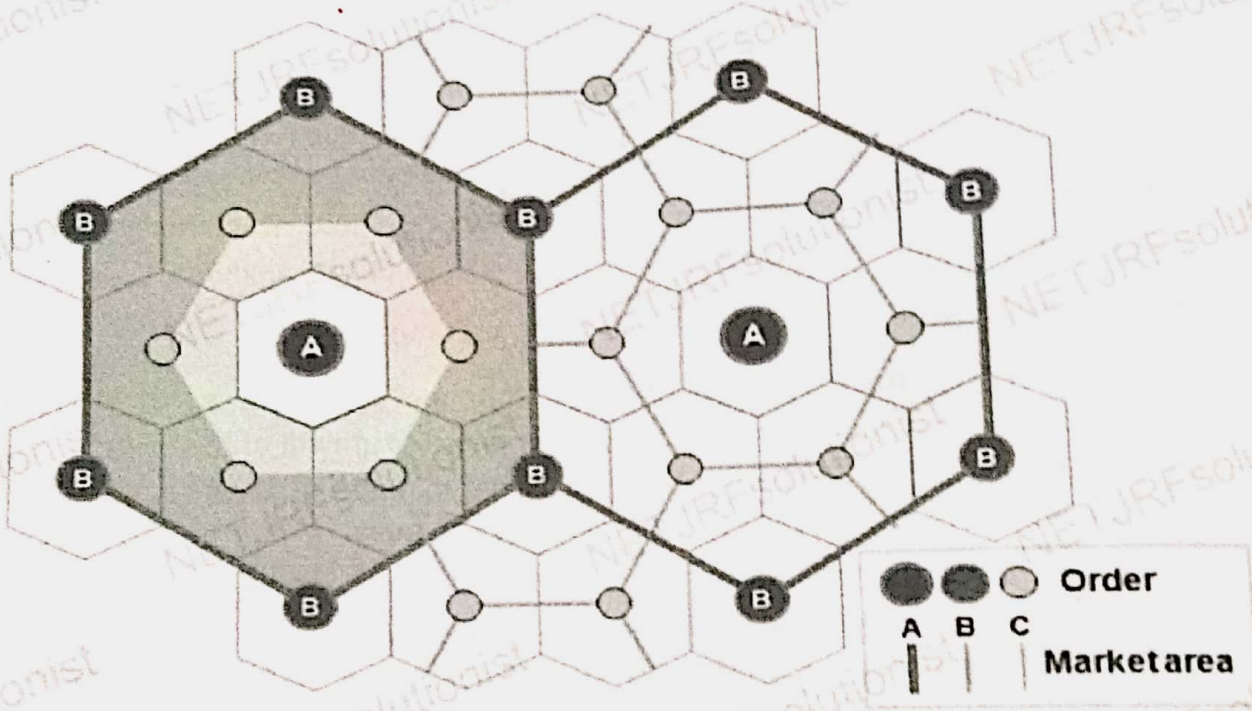
These assumptions when combined results in place offering different services.

In these places in which people enjoy the perfect market and purchase from the nearest place to save on money and time. Different services locate themselves on the basis of **the threshold population**. The minimum number of people required to sustain that service/activity. In addition to this, there is no preference for a particular shop. All people have access to equal resources and do not enjoy any advantage over its competitor. The demand for goods consumed & used on daily basis will be used more and vice versa.

Explanation of terms: Central Place, Low Order, High Order, Sphere of Influence.

A Central Place is a settlement which provides one or more services for the population living around it.

Low Order, High Order: Simple basic services (e.g. grocery stores) are said to be of low order. Specialized services (e.g. universities) are said to be of high order. Having a high order service implies there are low order services around it, but not vice versa. Settlements which provide low order services are said to be low order settlements. Settlements that provide high order services are said to be high order settlements.



The sphere of influence is the area under the influence of the Central Place.

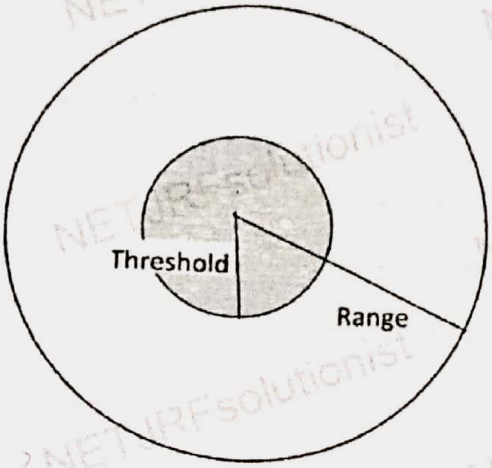
Two main concepts of Central Place Theory

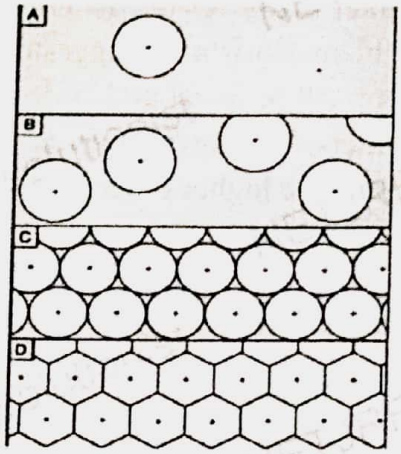
Central Place Theory is based on 2 fundamental concepts which are "Threshold" and "Range"

Threshold – The **minimum population** needed to make a service viable at a particular place. If this size is not reached then a particular activity will not start or it will be closed down.

Range – This is the maximum distance a consumer is willing to travel to purchase good or avail a service, beyond this distance consumer will not travel as the distance traveled

for good/service will outweigh the benefit. From these two concepts, the lower and upper limits of goods or services can be found. With the upper and the lower limits, it is possible to see how the central places are arranged in an imaginary area.

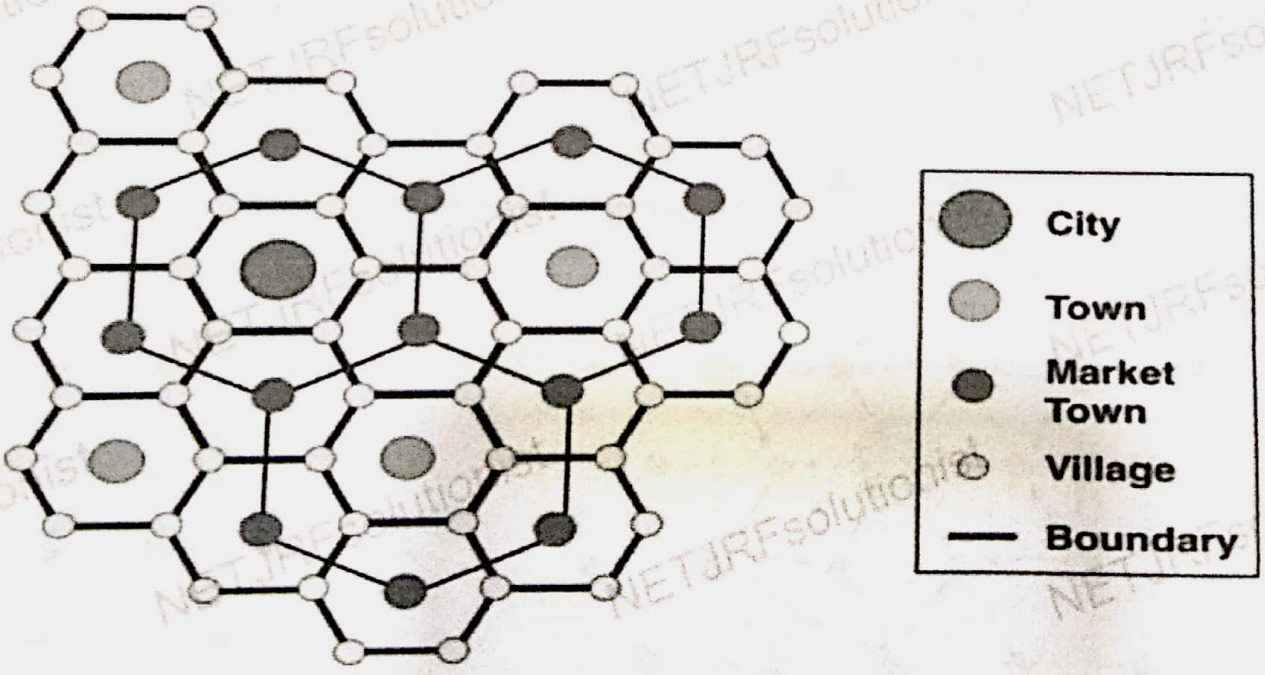




Sizes of settlements/communities as per central place theory

Walter Christaller gave **a system with 5 sizes of settlements** based on population. The smallest unit is Hamlet which is considered a rural community and the largest unit is Regional Capital. The rank order of central places in ascending order include:

1. Hamlet
2. Village
3. Town
4. City
5. Regional Capital/ Metropolis



Markets and Services tend to be nested hierarchies with smaller towns serving smaller markets. However, transportation and border effects can shift the distribution of towns away from theoretical uniformity.

The arrangement of the Central places/ settlements:

As transport is equally easy in all direction, each central place will have a circular market area as shown in C in the following diagram. However, the circular shape of the market areas results in either un-served areas or over-served areas. To solve this problem, Christaller suggested the hexagonal shape of the markets. Within a given area there will be fewer high order cities and towns in relation to the lower order villages and hamlets. For any given order, theoretically, the settlements will be equidistant from each other. The higher order settlements will be further apart than the lower order ones.

Principles in the arrangement of the central places:

Central place theory gives 3 principles which are the

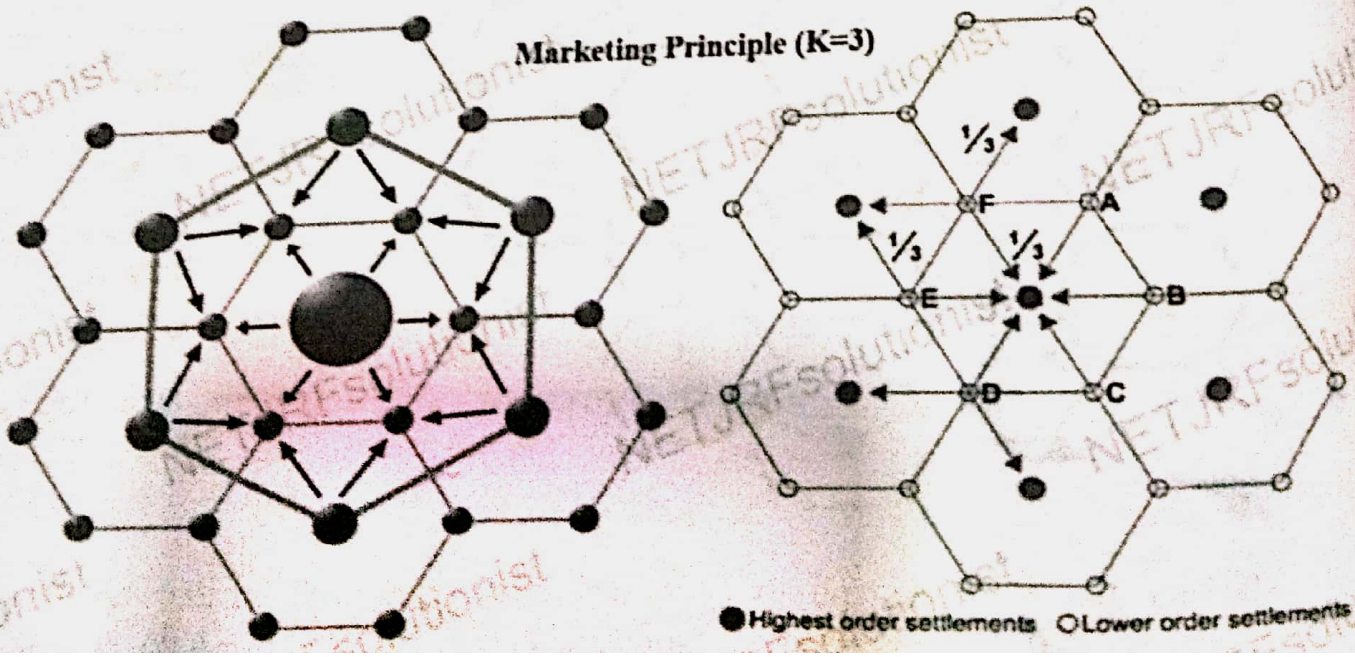
1. Administrative Principle (K=7)
2. Transport Principle/ Traffic Principle (K=4)
3. Marketing Principle (K=3)

Settlements are regularly spaced – equidistant spacing between same order centers, with larger centers farther apart as compared to smaller centers. The market area is hexagonal shaped as it is free from overlapping, most efficient in both number and function. The different layouts predicted by Christaller have *K*- values which show how much the Sphere of Influence of the central places.

The three principles of central place theory are as follows:

1. Marketing Principle (K=3):

As per this the market area of a higher order occupies one-third (1/3 part) of the market area of each of the consecutive lower size place(node) which lies on its neighbor. The lower size nodes (6 in numbers and 2nd larger circles) are located at the corner of the largest hexagon around the high-order settlement. Each high-order settlement gets 1/3rd of each satellite settlement (which are 6 in total), thus $K = 1 + 6 \times 1/3 = 3$.



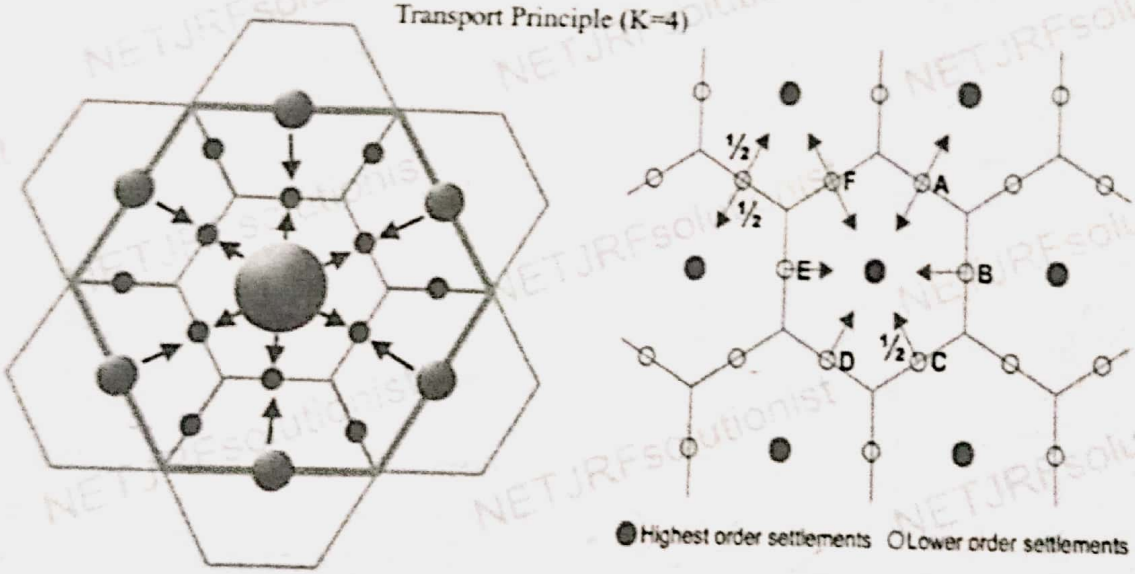
1, 2, 6, 18, 54, 162, 486 and so on. With K=3 the transport network is not efficient even when the distance traveled is reduced. This is because of the absence of transport links (network) between the larger places (nodes).

2. Transport Principle (K=4):

This provides for most efficient transport network. High order place half of the market area of 6 neighboring lower order places located on the edge of the hexagon formed by high order settlement. $K = 1 + 6 \times 1/2 = 4$.

1, 2, 8, 32, 128, 512, 2048 and so on. There are maximum central places possible. These are located on the main transport routes connecting the higher order center. The transportation principle involves the minimization of the length of roads connecting central places at all hierarchy levels. In this system of nesting, the lower order centers are all located along the roads linking the higher order centers. This alignment of places along a road leads to minimization of road length. However, for each higher order center, there are now four centers of immediate lower order, as opposed to three centers under the marketing principle.

Transport Principle (K=4)



3. Administrative Principle (K=7):

According to $K = 7$ administrative principle (or political-social principle), settlements are nested according to sevens. $K = 1 + 6 \times 1 = 7$.

1, 6, 42, 294, 2058, 14406, 100842 and so on. The largest settlement, which is in the centre of the hexagon, will be surrounded by a number of smaller settlements. People from the small settlements will visit the large settlement for a particular good or service that their village does not provide. People cannot cross the boundary hexagons because Cristaller says they must shop in their nearest central place.

Administrative Principle (K=7)